***Sellaphora harderi* (Hustedt) *comb. nov.* (Bacillariophyta, *Sellaphoraceae*), an overlooked terrestrial diatom**

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Navicula harderi Hustedt (in Brendenmühl 1949: 439) was originally described as a terrestrial diatom from deciduous forest soils in northern Germany. Its presence has been noted and illustrated in some recent studies of soils (Noga *et al*. 2014, Barragan *et al*. 2017), semi-terrestrial habitats such as springs and wetlands (Denys & Oosterlynck 2015, Isheva & Ivanov 2016, Szigyártó *et al*. 2017), caves (Klemenčič & Rhovšek 2005), and in rivers and streams (Juggins *et al*. 2016). *Navicula harderi* frequently co-occurs with *Sellaphora subseminulum* (Hustedt) C.E.Wetzel; indeed, both were closely compared in the same publication using material from the same sample. Due to their high morphological similarity using light microscopy these species were considered conspecific by some authors (e.g., Ettl & Gärtner 1995, Krammer & Lange-Bertalot 1985, 1986). However, Reichardt (2006) and Wetzel (2015) argued that they should not be considered synonyms based on striae density and the distinct large central area.

While investigating samples from a sandy soil (deciduous forest) in Luxembourg, we found two populations identified as *N. harderi* (> 5%) and *S. subseminulum* (< 1%). Since unprocessed material for both species is unavailable at the Hustedt collection in Bremerhaven (**BRM**), light (LM) and scanning electron microscopy (SEM) were performed in samples from Luxembourg to resolve and illustrate the ultrastructural characteristics of both species. These specimens agreed in morphology with the light microscopy of the types provided by Simonsen (1987, pl. 540: figs 1-7; 10-12).

Light microscopy analysis of *N. harderi* (Figs 2-31) revealed rhombic-lanceolate valves with moderately pointed apices (as highlighted in Hustedt's illustrations, here reproduced as Fig. 1). Straight and filiform raphe, and a variable axial area going from narrow linear to wide broad in the middle portion. A butterfly-like central area limited on the borders by the very short (usually 5 or 6) median striae. The striae continue shortly on the valve mantle with the presence of mostly one areola per stria on the valve mantle. External shallow grooves enclosing the raphe system were observed constantly in all specimens (Figs 32-40); beyond the helictoglossa, a larger foramen-like (pit) can be seen (Fig. 41) at the poles. Based on our measurements from material the species is 6-12 µm long and has a width of 3-4 µm. It has radiant striae with a number of 30-35 in 10 µm

Navicula harderi fits into the group of small-celled *Sellaphora* Mereschkowsky (1902: 186) species such as *S. seminulum* (Grunow) D.G.Mann (1989: 2), and the diatom currently referred to as *Sellaphora atomoides* (Grunow) C.E.Wetzel & Van de Vijver in Wetzel *et al.* (2005: 219) which are characterized by small dimensions with barely resolvable features under the light microscope. Although a key feature of the genus *Sellaphora* is the shape of the chloroplast ('endochrome'); i.e., a single H-shaped plate and gives the genus its name (*Sellaphora* = 'saddle-bearer') (Mann, Thomas & Evans 2008), the chloroplast morphology has not been documented in many naviculoid diatoms, including *N. harderi*. However, other morphological characteristics of *Sellaphora*, according to Round, Crawford & Mann (1990: 552), include naviculoid and solitary cells, with uninterrupted uniseriate (rarely biseriate), radiate or parallel striae. The striae contain small round to irregular squared poroids, which are occluded near their internal apertures by hymenes.

Transapically orientated bar-like thickenings occur at the poles in some species (see Mann, Thomas & Evans 2008). Adjacent to the axial area there may be a non-porous conopeum. The valve face is flat, except that it is often grooved near the raphe externally, and curves fairly gently into shallow or moderately deep mantles. The raphe system is central and straight. Terminal fissures are usually present, and may be deflected or hooked. The central external raphe endings are expanded and slightly deflected towards the primary side, and the central internal endings are also turned or deflected towards the primary side. We should also add that many, if not all, species possess an internal apical pit at both poles.

Based on the valve ultrastructure analysis and similarities with other *Sellaphor*a species (*Sellaphoraceae*) we propose the following combination:

***Sellaphora harderi* (Hustedt) J.Foets & C.E.Wetzel, *comb. nov*. (Figs 1-42)**
Basionym: *Navicula harderi* Hustedt in Brendemühl 1949, *Archiv für Mikrobiologie*, vol. 14, p. 439, fig. 4.

Holotype: slide N12/80. Wenzen bei Göttingen. Buchenwaldrand, Bremerhaven,Germany (**BRM**), as indicated, and illustrated in Simonsen (1987: 354, pl. 540: figs 1-5).

Additional illustrations: Krammer & Lange-Bertalot (1986: 229, pl. 76, figs 1-6; *pro parte*, includes *Navicula subseminulum* on fig. 7).

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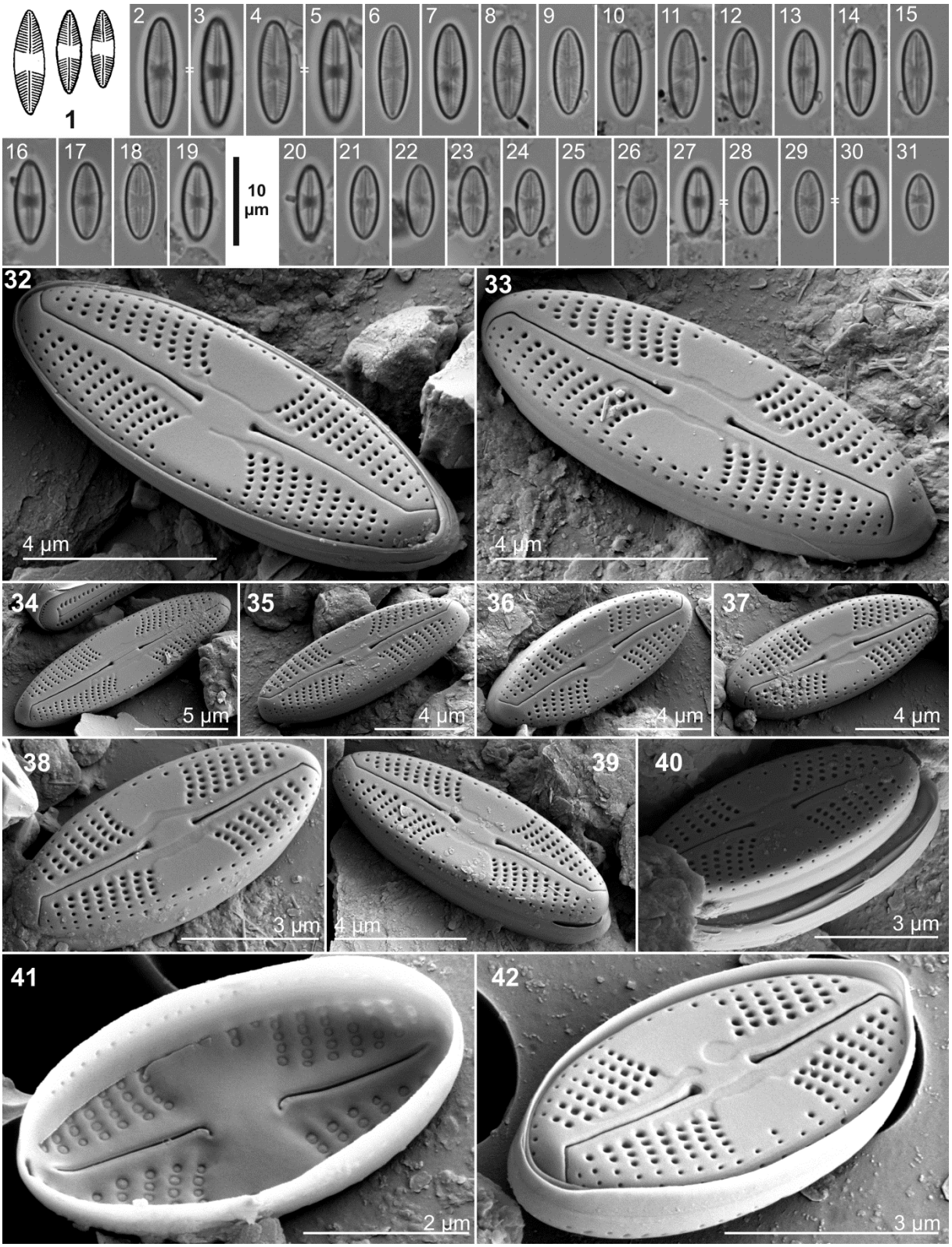
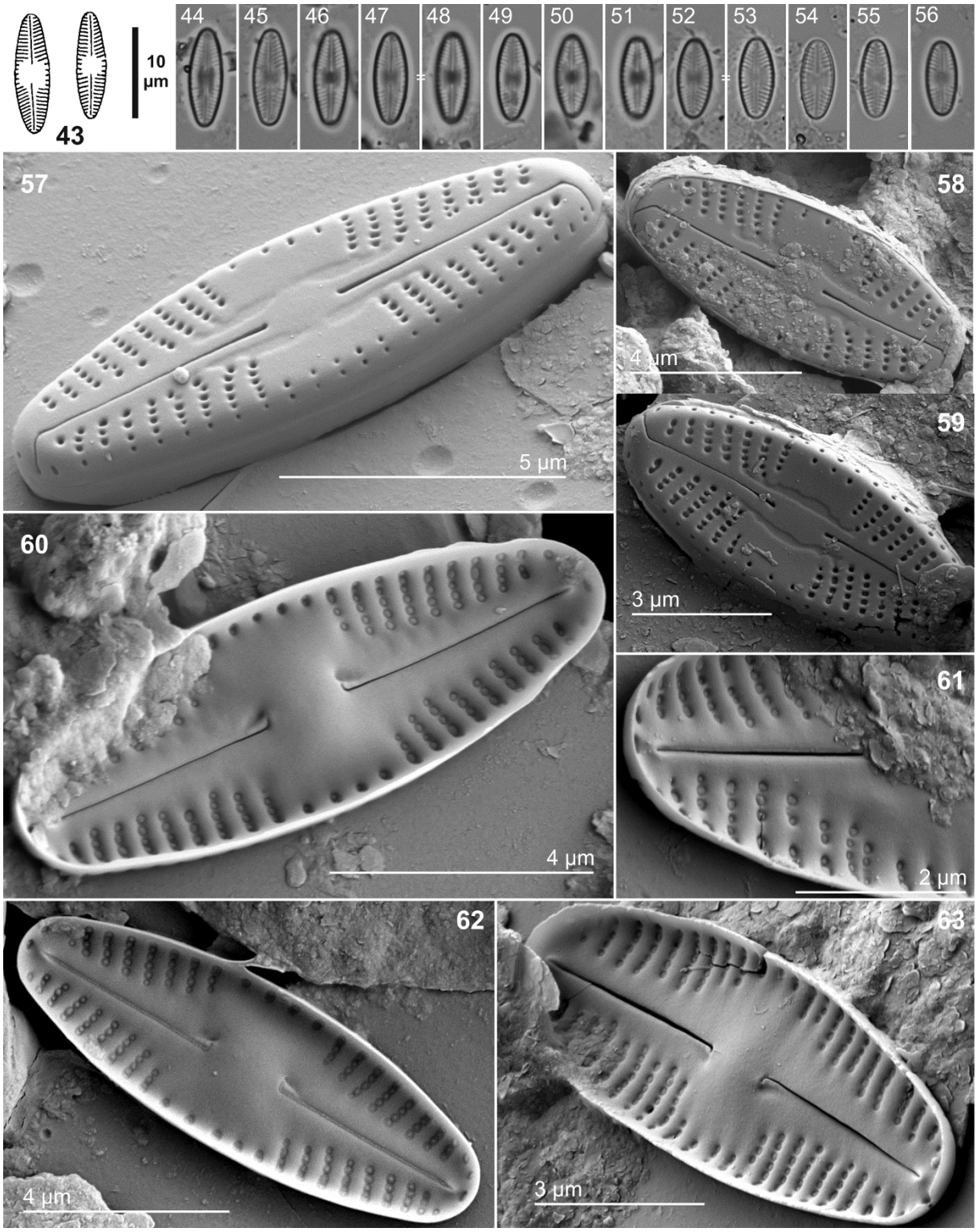


Figures 1-21: *Sellaphora harderi* (Hustedt) J.Foets & C.E.Wetzel, *comb. nov*. Fig. 1. Original drawings of *Navicula harderi* Hustedt (in Brendenmühl 1949, fig. 4). Figs 2-42: LM and SEM images of a population collected from soil (deciduous forest) in Luxembourg (Attert River basin) showing rhombic-lanceolate valves with moderately pointed apices (Figs 2-31). Figs 32-42: SEM images. Note the large central area and reduced striae. Shallow grooves enclosing the raphe system mainly near the central area.



Figures 43-63: *Sellaphora subseminulum* (Hustedt) C.E.Wetzel. Fig. 1. Original drawings of *Navicula subseminulum* Hustedt (in Brendenmühl 1949, fig. 6). Figs 43-63: LM and SEM images of a population collected from soil (deciduous forest) in Luxembourg (Attert River basin). Note the large central area and short striae as well as the shallow grooves enclosing the raphe system mainly near the central area. Internal proximal raphe endings depressed and hooked.